

US009665633B2

(12) United States Patent

Dageville et al.

(10) Patent No.: US 9,665,633 B2

(45) **Date of Patent:** May 30, 2017

(54) DATA MANAGEMENT SYSTEMS AND METHODS

(71) Applicant: Snowflake Computing Inc., San

Mateo, CA (US)

(72) Inventors: **Benoit Dageville**, Foster City, CA (US);

Thierry Cruanes, San Mateo, CA (US); Marcin Zukowski, San Mateo,

CA (US)

(73) Assignee: Snowflake Computing, Inc., San

Mateo, CA (US)

(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 14/518,873

(22) Filed: Oct. 20, 2014

(65) Prior Publication Data

US 2015/0234688 A1 Aug. 20, 2015

Related U.S. Application Data

- (60) Provisional application No. 61/941,986, filed on Feb. 19, 2014.
- (51) Int. Cl.

 G06F 9/46 (2006.01)

 G06F 17/30 (2006.01)

 G06F 9/50 (2006.01)

 G06F 9/48 (2006.01)

 H04L 29/08 (2006.01)

(52) U.S. Cl.

CPC G06F 17/30575 (2013.01); G06F 9/4881 (2013.01); G06F 9/5016 (2013.01); G06F 9/5088 (2013.01); G06F 17/302 (2013.01); G06F 17/3048 (2013.01); G06F 17/30292 (2013.01); G06F 17/30315 (2013.01); G06F 17/30371 (2013.01); G06F 17/30463

(2013.01); G06F 17/30466 (2013.01); G06F 17/30498 (2013.01); G06F 17/30545 (2013.01); G06F 17/30598 (2013.01); G06F 17/30864 (2013.01); G06F 17/30867 (2013.01);

(Continued)

(58) Field of Classification Search

None

See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

5,787,466 A 7/1998 Berliner 6,490,590 B1 12/2002 Fink (Continued)

FOREIGN PATENT DOCUMENTS

CN 102496060 6/2012 CN 203261358 10/2013 (Continued)

Primary Examiner — Gregory A Kessler (74) Attorney, Agent, or Firm — David R. Stevens; Stevens Law Group

(57) ABSTRACT

Example data management systems and methods are described. In one implementation, a method identifies multiple files to process based on a received query and identifies multiple execution nodes available to process the multiple files. The method initially creates multiple scansets, each including a portion of the multiple files, and assigns each scanset to one of the execution nodes based on a file assignment model. The multiple scansets are processed by the multiple execution nodes. If the method determines that a particular execution node has finished processing all files in its assigned scanset, an unprocessed file is reassigned from another execution node to the particular execution node

24 Claims, 14 Drawing Sheets

